IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Patent Application

Applicant(s):	Fischer et al.
Case:	45-14-2
Serial No.:	10/719,655
Filing Date:	November 21, 2003
Group:	2627
Examiner:	Dismery E. Mercedes
Title:	Magnetic Storage Write Heads Using Micro-Electro Mechanical Shutters

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REPLY BRIEF

Mail Stop Appeal Brief – Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

Appellants hereby reply to the Examiner's Answer, mailed October 3, 2007 (referred to hereinafter as "the Examiner's Answer"), in an Appeal of the final rejection of claims 1-20 in the above-identified patent application.

REAL PARTY IN INTEREST

A statement identifying the real party in interest is contained in Appellants' Appeal Brief.

RELATED APPEALS AND INTERFERENCES

A statement identifying related appeals is contained in Appellants' Appeal Brief.

STATUS OF CLAIMS

A statement identifying the status of the claims is contained in Appellants' Appeal Brief.

STATUS OF AMENDMENTS

A statement identifying the status of the amendments is contained in Appellants' Appeal Brief.

SUMMARY OF CLAIMED SUBJECT MATTER

A Summary of the Invention is contained in Appellants' Appeal Brief.

STATEMENT OF GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

A statement identifying the grounds of rejection to be reviewed on appeal is contained in Appellants' Appeal Brief.

CLAIMS APPEALED

A copy of the appealed claims is contained in an Appendix of Appellants' Appeal Brief.

ARGUMENTS

Section 112 Rejection of Claims 1-20

The Examiner asserts that the Specification does not address the claim limitation "a shutter to selectively allow said magnetic field to alter a magnetic domain of said magnetic storage medium," how the shutter is controlled "so as to selectively allow or inhibit the path of the magnetic field to alter the magnetic domain of the magnetic storage medium," or "how the medium is attached and how the medium behaves when it is allowing or inhibiting the magnetic flux of the write coil." The Examiner further asserts that the "descriptions are insufficient for one of ordinary skill in the art to understand how is this 'shutter' working in the head in order to selectively allow the magnetic field to alter this magnetic domain."

As indicated in the above summary section, the specification describes in FIG. 2 and the corresponding text a shutter (200) to selectively allow said magnetic field to alter a magnetic domain of said magnetic storage medium (page 3, lines 16-25; page 4, lines 16-18; page 5, lines 13-22)

As indicated in Appellants' prior responses, Appellants do not allege to have invented a shutter system. In fact, shutters were well known to those of ordinary skill in the art at the time the present application was filed. MEMS shutter arrays were available commercial products at the time the application was filed. See, for example, http://www.electronicproducts.com/ShowPage.asp?SECTION=3700&PRIMID=&FileName=sep OL1.sep2003 (describing a MEMS-based light manipulation technology for display and other light manipulation applications), attached as an Exhibit hereto. Please note the date tag in the URL of September 2003 and the present filing date of November 2003. This commercial shutter array is a matrix of "flipping pixels" that can be opened or closed to allow light through. The documentation associated with such a commercial shutter system would clearly describe how to open or close the shutter.

The Examiner asserts that Appellants do not "specify under which conditions the 'shutter' is activated or enabled to selectively allow or block the magnetic field." Appellants submit that the specific conditions under which the shutter is activated or enabled to selectively allow or block the magnetic field is a design choice, influenced by the particular shutter selected. The composition of the shutter is addressed further below.

The present invention is directed to selectively altering the magnetic domain of a magnetic storage material 150 by controlling the path of a magnetic field 120 *using* one or more shutters 200. In the disclosed magnetic storage system of the present invention, a person of ordinary skill in the art would understand, based on the present disclosure and the commercial availability of such shutter arrays, how to open or close the shutter to selectively allow a magnetic field to alter a magnetic domain of the magnetic storage medium.

In this regard, the present specification teaches:

> In an open position of the shutter 200, the magnetic field 120 is allowed to pass the shutter 200 and will follow an outer loop 130 comprised of magnetic material segments 132, 134, 136 and the magnetic storage material 150. In a closed position of the shutter 200, the magnetic field 120 is not allowed to pass the shutter 200 and will follow an inner loop 140 that bypasses the disk 150 and is comprised of magnetic material segments 132, 134, 136 and 138. In this manner, the magnetic domain of the magnetic storage medium 150 is selectively altered based on the position of the shutter 200.
> (Original Specification, at page 3, lines 18-24.)

FIG. 2, and the corresponding text on page 4 of the specification, illustrate an exemplary shutter array 200. In this regard, the present specification teaches how the shutter array is *constructed* and how it *operates*:

> As shown in FIG. 2, each shutter element 210 can *pivot across a central axis* between an open (not shown) and closed position (shown), in a *similar manner to a venetian blind*. The position of each shutter element 210 can be *controlled*, for example, *using micro electro mechanical systems (MEMS) or other micromachine control elements*. It is noted that micro electro mechanical systems switches are **increasingly used** for optical networks and other applications. In an optical network application, MEMS switches have been employed, for example, to move a mirror that changes the propagation direction of light, or blocks the light entirely. United States Patent Number 5,974,207, for example, discloses a wavelength-selective add-drop multiplexer that uses movable mirrors to add and/or drop spectral components from a wavelength-division-multiplexed optical signal. *Magnetic shielding may be implemented using Nickel (Ni) metallization or Cobalt (Co) deposition on the shutter mechanisms 210*. In this manner, when the shutter elements 210 are in a closed position, the magnetic field will be reflected to the inner loop 140.
> (Original Specification, at page 4, lines 3-15; emphasis added.)

Shutter Operation (Behavior)

As indicated in the above passage, MEMS devices were well known and already frequently used for other applications at the time of the filing of the present application. The

referenced United States Patent Number 5,974,207 describes using a MEMS-based actuator to move an optical device, such as a mirror, into, and out of, the path of an optical signal. The operation of the shutter for magnetic applications would be obvious to a person of ordinary skill in the art, based on the teachings of the present invention, United States Patent Number 5,974,207, as well as commercially available shutter devices.

Thus, contrary to the assertion of the Examiner, the present specification gives clear guidance on how the shutters behave. In the above-described exemplary embodiment, the shutters are mounted in an array, such that they can pivot across a central axis between an open and closed position. The pivoting is controlled using MEMS devices which were very well known to those of ordinary skill in the art at the time of filing, as evidenced by U.S. Patent No. 5,974,207 which was cited in the original filing.

Shutter Construction (Shutter Attachment)

Again, in the above-described exemplary embodiment, the shutters are fabricated in an array, such that they can pivot across a central axis between an open and closed position. Such a configuration was very well known to those of ordinary skill in the art at the time of filing. See, for example, the commercial shutter array product referenced above and attached hereto. The pivoting arrangement indicates how the shutters are *attached*.

With regard to the *composition* of the shutters themselves, the original specification teaches that the shutters can be coated with a magnetic shielding, such as Nickel or Cobalt. See page 4, lines 12-13. See also, claims 7-9.

In the Examiner's Answer, the Examiner asserts that Appellants have failed to explain and disclose the specific conditions under which the shutter is controlled, activated, or enabled to selectively allow or block the path of the magnetic field to alter the domain of the magnetic storage material.

Appellants note that the present disclosure teaches that

> the shutters S1-S4 may be implemented in a similar manner to FIG. 2, where each shutter element 210 pivots across a central axis between an open (not shown) and closed position (shown), similar to a venetian blind. In such an implementation, *a value of -1 is written to the disk 150 by enabling the*

> *first lower path 420-L_1. The first lower path 420-L_1 is enabled by opening shutter S2 and closing shutter S1. In addition, the second upper path 420-U_2 should be enabled to prevent the simultaneous writing of a value of +1 by opening shutter S3 and closing shutter S4. Similarly, a value of +1 is written to the disk 150 by enabling the second lower path 420-L_2. The second lower path 420-L_2 is enabled by opening shutter S4 and closing shutter S3. In addition, the first upper path 420-U_1 should be enabled to prevent the simultaneous writing of a value of -1 by opening shutter S1 and closing shutter S2.*
> (Page 6, lines 17-26; emphasis added.)

Thus, the present disclosure teaches the specific conditions under which the shutter is controlled, activated, or enabled to selectively allow or block the path of the magnetic field to alter the domain of the magnetic storage material. (See also, page 4, line 23, to page 5, line 22, of the originally filed disclosure.)

In addition, Appellants note that the Examiner has rejected the cited claims as being obvious over Crue and Tamura. In this regard, the Examiner asserts that "it would have been obvious to one of ordinary skill in the art at the time of the invention, to implement a MEMS electromagnetic actuable device having a shutter coupled therein as disclosed by Tamura et al., to the system as disclosed by Crue at al., the motivation being to provide a device that selectively generates displacement forces which allow the actuable device coupled to the shutters, to move in and out of the magnetic field path...which results in selectively allowing the magnetic field to flow thereby causing alteration of the magnetic domain." Thus, the Examiner appears to admit that, in view of the cited art, the specific conditions under which the shutter is controlled, activated, or enabled to selectively allow or block the path of the magnetic field to alter the domain of the magnetic storage material is either well known prior art, is disclosed by the cited prior art, or would be obvious to a person of ordinary skill in the art. In any case, as described above, the present disclosure teaches the specific conditions under which the shutter is controlled, activated, or enabled to selectively allow or block the path of the magnetic field to alter the domain of the magnetic storage material.

Appellants submit that the claimed subject matter is described in the original specification in such a way as to enable a person of ordinary skill in the art to make and use the invention without undue experimentation. Thus, Appellants respectfully request withdrawal of

the rejection of claims 1-20 under 35 U.S.C. §112, first paragraph.

Section 103 Rejection of Independent claims 1, 10, and 14

Independent claims 1, 10, and 14 are rejected under 35 U.S.C. §103(a) as being unpatentable over Crue et al. in view of Tamura et al. Regarding claim 1, for example, the Examiner asserts that Crue teaches at least one write coil to generate a magnetic field for at least a plurality of bit intervals (citing Figs. 2-4; 44); and a magnetic storage medium (Fig. 1; 16). The Examiner notes that Crue alters the magnetic domains of the magnetic medium by changing the direction of the magnetic field, but acknowledges that Crue *fails to specifically disclose* at least one shutter to selectively allow said magnetic field to alter a magnetic domain of said magnetic storage medium.

In the Examiner's Answer, the Examiner asserts that "it would have been obvious to one of ordinary skill in the art at the time of the invention, to implement a MEMS electromagnetic actuable device having a shutter coupled therein as disclosed by Tamura et al., to the system as disclosed by Crue at al., the motivation being to provide a device that selectively generates displacement forces, which allow the actuable device coupled to the shutters, to move in and out of the magnetic field path, which results in selectively allowing the magnetic field to flow thereby causing alteration of the magnetic domain." The Examiner asserts that the references are properly combinable since Tamura discloses that a MEMS electromagnetic device can be employed in a variety of applications, including in electrical, mechanical and optical systems, and combinations thereof (col. 1, lines 24-27).

Appellants note that Crue teaches that

> ***changing the direction of current*** changes the direction of flux created by the recording head, and therefore changes the magnetic fields within the magnetic storage medium. A binary "0" is recorded by maintaining a constant direction of magnetic flux through the main pole, and a binary "1" is recorded by ***changing*** the direction of magnetic flux through the main pole.
> (Col. 3, lines 36-42; emphasis added.)

The present invention energizes a write coil for at least a plurality of bit intervals. The path of the magnetic field is controlled by one or more **shutters** to *selectively* alter the

magnetic domain of a magnetic storage material. The Examiner asserts that Tamura et al. discloses a MEMS device comprising a shutter to block or allow the signal level by placing a shutter into and out of the *optical* path (citing col. 18, lines 35-67; emphasis added) The Examiner asserts that the motivation for such a combination is to provide a device that selectively generates displacement forces (citing col. 1, lines 23-25). Appellants are at a loss to understand how the provision of a device that selectively generates "displacement forces" motivates the present invention.

Appellants respectfully submit that the Examiner has failed to establish a *prima facie* case of obviousness for at least the reason that there exists no motivation to combine the references, and further, even if combinable, the references collectively do not teach each and every limitation of the independent claims. See, M.P.E.P. §2143.

Appellants submit that there is no suggestion to combine the *magnetic* storage system of Crue with the *optical* shutter system of Tamura, other than the hindsight provided by the present invention.

In addition, even if combined, the combination does not disclose or suggest a shutter to selectively allow said **magnetic field** to alter a magnetic domain of said magnetic storage medium. Crue does not disclose a shutter at all (as acknowledged by the Examiner) and the shutter of Tamura alters an *optical* signal.

The Examiner further asserts that, based on Appellant's own submission on pages 5-6 of Arguments, it would have been obvious to of ordinary skill in the art at the time of the invention to implement shutters as evidenced by Tamura et al., for magnetic applications, as disclosed by Crue in order to control (open/close) the flow of the magnetic field to selectively allow the alteration of the magnetic domain, that is disclosed by Crue and as evidenced by U.S. 5,974,207. The Examiner also asserts that Appellant admits that "it is clear that the use operation of a shutter (in an optical environment) for magnetic applications is well known and obvious to one of ordinary skill in the art" at page 5, lines 30-32.

Appellants note that Appellants' cited statement reads:

> As indicated in the above passage, MEMS devices were well known and already frequently used for other applications at the time of the filing of the present application. The referenced United States Patent Number 5,974,207 describes using a MEMS-based actuator to move an optical device, such as a mirror, into, and out of, the path of an optical signal. The operation of the shutter for magnetic applications would be obvious to a person of ordinary skill in the art, based on the teachings of the present invention, United States Patent Number 5,974,207, as well as commercially available shutter devices. (Page 5, lines 26-32, of original Appeal Brief.)

The first sentence notes that MEMS devices are well known. The second sentence states that USPN 5,974,207 describes using a MEMS-based actuator in an optical system. The final sentence states that the *operation* of a shutter would be obvious *based on the teachings of the present invention*. Appellants have made no admission that "the ***use*** (or) operation of a shutter (in an optical environment) *for magnetic applications* is well known and obvious."

Thus, Crue et al. and Tamura et al., alone or in combination, do not disclose or suggest at least one shutter to selectively allow said magnetic field to alter a magnetic domain of said magnetic storage medium, as required by independent claims 1 and 14, and do not disclose or suggest selectively allowing said magnetic field to alter a magnetic domain of said magnetic storage medium by utilizing a shutter, as required by independent claim 10.

Claims 2-9, 11-13 and 15-20 are dependent on independent claims 1, 10 and 14, respectively and are therefore patentably distinguished over Crue et al. and Tamura et al. because of their dependency from independent claims 1, 10 or 14 for the reasons set forth above, as well as other elements these claims add in combination to their base claim.

Thus, Appellants respectfully request withdrawal of the rejection of claims 1-20 under 35 U.S.C. §103.

The attention of the Examiner and the Appeal Board to this matter is appreciated.

Respectfully,

Date: December 3, 2007

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APPENDIX

1 A magnetic storage system, comprising:

at least one write coil to generate a magnetic field for at least a plurality of bit intervals;

a magnetic storage medium; and

at least one shutter to selectively allow said magnetic field to alter a magnetic domain of said magnetic storage medium.

2 The magnetic storage system of claim 1, further comprising at least one magnetic pole segment to provide a loop between said at least one write coil and said magnetic storage medium.

3 The magnetic storage system of claim 1, comprising a first write coil to generate a positive magnetic field, a second write coil to generate a negative magnetic field, and at least two shutters to selectively allow said positive or negative magnetic fields to alter said magnetic domain of said magnetic storage medium.

4. The magnetic storage system of claim 3, wherein said positive or negative magnetic fields alter said magnetic domain in a collocated region of said magnetic storage medium.

5 The magnetic storage system of claim 3, further comprising a first set of magnetic pole segments to provide a first loop between said first write coil and said magnetic storage medium and a second set of magnetic pole segments to provide a second loop between said second write coil and said magnetic storage medium.

6 The magnetic storage system of claim 1, wherein a position of said shutter is adjusted using a micro-electro mechanical system.

7. The magnetic storage system of claim 1, wherein at least one of said shutters is coated with a magnetic shielding.

8. The magnetic storage system of claim 7, wherein said magnetic shielding is comprised of Nickel.

9 The magnetic storage system of claim 7, wherein said magnetic shielding is comprised of Cobalt.

10. A method for recording information in a magnetic storage medium, said method comprising the steps of:

generating a magnetic field for at least a plurality of bit intervals; and

selectively allowing said magnetic field to alter a magnetic domain of said magnetic storage medium for each bit interval by utilizing a shutter.

11. The method of claim 10, further comprising the steps of generating a positive magnetic field and a negative magnetic field, and selectively allowing said positive or negative magnetic fields to alter said magnetic domain of said magnetic storage medium.

12. The method of claim 11, wherein said positive or negative magnetic fields alter said magnetic domain in a collocated region of said magnetic storage medium.

13. The method of claim 10, wherein said step of selectively allowing said magnetic field to alter a magnetic domain is performed by at least one shutter and said method further comprises the step of adjusting a position of said shutter using a micro-electro mechanical system.

14. A write head for a magnetic storage system, comprising:

at least one write coil to generate a magnetic field for at least a plurality of bit

intervals; and

at least one shutter to selectively allow said magnetic field to alter a magnetic domain of a magnetic storage medium.

15. The write head of claim 14, further comprising at least one magnetic pole segment to provide a loop between said at least one write coil and said magnetic storage medium.

16. The write head of claim 14, comprising a first write coil to generate a positive magnetic field, a second write coil to generate a negative magnetic field, and at least two shutters to selectively allow said positive or negative magnetic fields to alter said magnetic domain of said magnetic storage medium.

17. The write head of claim 16, wherein said positive or negative magnetic fields alter said magnetic domain in a collocated region of said magnetic storage medium.

18. The write head of claim 16, further comprising a first set of magnetic pole segments to provide a first loop between said first write coil and said magnetic storage medium and a second set of magnetic pole segments to provide a second loop between said second write coil and said magnetic storage medium.

19. The write head of claim 14, wherein a position of said shutter is adjusted using a micro-electro mechanical system.

20. The write head of claim 14, wherein at least one of said shutters is coated with a magnetic shielding.

EVIDENCE APPENDIX

The following evidence has been relied on in the above argument:

Exhibit 1:

http://www electronicproducts.com/ShowPage asp?SECTION=3700&PRIMID=&FileName=sepOL1.sep2003 (describing a MEMS-based light manipulation technology for display and other light manipulation applications)

United States Patent Number 5,974,207

RELATED PROCEEDINGS APPENDIX

There are no known decisions rendered by a court or the Board in any proceeding identified pursuant to paragraph (c)(1)(ii) of 37 CFR 41.37